**BIOL 112 – COMPILED KEY CONCEPTS**

1. Darwinian Evolution

* Evidence for evolution
* Darwin’s theory
* The Modern Synthesis

1. Evolution of Populations

* The Modern Synthesis
* Populations and the Gene Pool
* The Hardy-Weinberg Equilibrium
* Micro-evolution
* Sources of Genetic Variation
* Natural Selection
* Preservation of Genetic Variation

1. Origin of Species

* Species concepts
* Development of reproductive isolation
* Patterns of speciation
* Macroevolution
* Human evolution
* Evolution continues…..

1. Plant Structure, Growth and Development

* What is a kingdom?
* What makes a plant a plant?
* The hierarchy of structure – plant cells, tissues and organs
* Primary growth – elongation
* Secondary growth – diameter expansion
* Morphogenesis occurs during growth

1. Plant Transport

* The importance of water
* Water potential: Ψ = P - s
* How water moves – gradients, mechanisms and pathways
* Transpiration – water movement from soil to plant to atmosphere
* The pressure flow model of phloem transport

1. Plant Nutrition and Soils

* Resources
  + Which are required
  + How they are used
* Essential elements
  + What they are
  + What they do
* Soils and soil forming factors
* The rhizosphere
* Some alternate methods to acquire nutrients

1. Angiosperm Reproduction

* Life Cycles – the alternation of generations
* The structure of a flower
* Development of the male gametophyte
* Pollination in all its glories
* Development of the female gametophyte
* Fertilization
* Embryos, seeds and fruit
* Asexual reproduction

1. Introduction to Animal Structure and Function

* What separates animals from other organisms?
* Introduction to structure and function relationships
* Exchanges with the external environment
* Hierarchical organization in animals
* Cells and tissues
* Organ systems
* Homeostasis and thermoregulation

1. Animal Nutrition and Digestion

* Animals are heterotrophic!
* Nutritional needs
  + Energy
  + Carbon skeletons
  + Essential nutrients
* Food processing
* The human digestive system

1. Animal Circulation and Gas Exchange Systems

* Circulation and gas exchange
* How we circulate – spanning diversity
* Hearts – the evolution of double circulation
* Blood circulation and capillary exchange
* Blood structure and function
* Gas exchange – spanning diversity
* Breathing – spanning diversity
* Respiratory pigments

1. Animal Osmoregulation

* Water and metabolic waste
* The osmotic challenges of different environments
* The sodium/potassium pump and ion channels
* Nitrogenous waste
* Osmoregulation and excretion in invertebrates
* Osmoregulation and excretion in vertebrates

1. Animal Immune Systems

* Innate immunity provides broad-spectrum defense against many pathogens
* Acquired immunity is very specific, develops over time, and relies on B and T cells
* Antigen recognition properties of B and T cells
* B and T cell binding sites develop randomly!
* Integrated B and T cell function
* When the immune system goes wrong…

1. Animal Nervous Systems

* Evolution of organization in nervous systems
* Neuron structure and function
* Neuron communication at synapses
* Organization of the vertebrate nervous systems
* Brain structure and function
* The cerebral cortex
* Nervous system injuries and diseases